

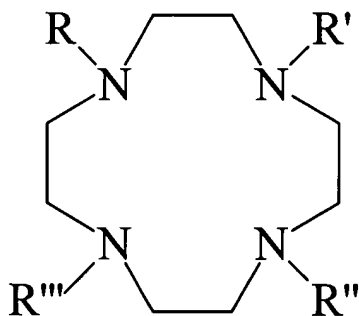
AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS::

1. (Currently amended) A chemical exchange saturation transfer contrast agent comprising:

a tetraazacyclododecane ligand having a general formula as follows:



wherein pendent arms R, R', R'' and R''' are amides having a general formula:

$-\text{CR}_1\text{H}-\text{CO}-\text{NH}-\text{CH}_2-\text{R}_2$, wherein R_1 ~~includes organic substituents~~ is selected from the group consisting of:

H;

Alkyl groups having 20 carbon atoms or less;

Cycloalkyl groups having 20 carbon atoms or less;

Alkyloxy groups having 20 carbon atoms or less;

Alkyl ethers having 10 oxygen atoms or less and 20 carbon atoms or less; and

Polyols having 20 carbon atoms or less, and

R_2 is not hydrogen is selected from the group consisting of:

$-\text{COOEt}$;

$-\text{COO}^-$;

$-\text{POOEt}$;

$-\text{PO}_3^{-2}$;

pyridine; and

phenol;

a paramagnetic metal ion coordinated to said tetraazacyclododecane ligand wherein
said paramagnetic metal is selected from the group consisting of:

Eu³⁺;

Tb³⁺;

Dy³⁺;

Ho³⁺;

Pr³⁺;

Nd³⁺;

Sm³⁺;

Er³⁺; and

Tm³⁺; and

a water molecule bound to ~~associated with~~ said tetraazacyclododecane ligand and said
paramagnetic metal ion wherein said water molecule has a $\Delta\omega \bullet \tau_M \geq 1$ and a $\Delta\omega \geq 6$ ppm.

Claims 2-3 (Canceled)

4. (Previously presented) The contrast agent as recited in Claim 2 wherein said $\Delta\omega \geq 20$ ppm.

Claim 5-6 (Canceled)

7. (Original) The contrast agent as recited in Claim 1 wherein said R₂ does not have a proton
exchangeable group.

8. (Original) The contrast agent as recited in Claim 7 wherein said R₂ is selected from the group
consisting of:

Alkyl groups having 20 carbon atoms or less;

Cycloalkyl groups having 20 carbon atoms or less;

Alkyloxy groups having 20 carbon atoms or less;

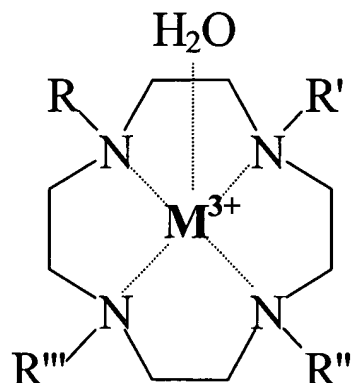
Alkyl ethers having 10 oxygen atoms or less and 20 carbon atoms or less; and

Polyols having 20 carbon atoms or less.

Claim 9. (Canceled)

10. (Currently amended) A method of using a magnetic resonance (MR) chemical exchange saturation transfer contrast agent, comprising:

subjecting a contrast agent contained within a sample to a radio frequency pulse wherein said contrast agent is a tetraazacyclododecane ligand having a general formula of:



wherein pendent arms R, R', R'' and R''' ~~comprise organic substituents~~ are amides having a general formula:

-CR₁H-CO-NH-CH₂-R₂, wherein R₁ is selected from the group consisting of:

H;

Alkyl groups having 20 carbon atoms or less;

Cycloalkyl groups having 20 carbon atoms or less;

Alkyloxy groups having 20 carbon atoms or less;

Alkyl ethers having 10 oxygen atoms or less and 20 carbon atoms or less; and

Polyols having 20 carbon atoms or less, and

R₂ is selected from the group consisting of:

-COOEt;

-COO⁻;

-POOEt;

-PO₃⁻²;

pyridine; and

phenol and said tetraazacyclododecane ligand further includes a paramagnetic

metal ion (M^{3+}) coordinated to said tetraazacyclododecane ligand wherein said paramagnetic metal is selected from the group consisting of:

Eu³⁺;

Tb³⁺;

Dy³⁺;

Ho³⁺;

Pr³⁺;

Nd³⁺;

Sm³⁺;

Er³⁺; and

Tm³⁺, and a water molecule (H_2O) bound to ~~associated with~~ said tetraazacyclododecane ligand and said paramagnetic metal wherein said water molecule has a $\Delta\omega \bullet \tau_M \geq 1$ and a $\Delta\omega \geq 6$ ppm; and

obtaining a magnetization transfer signal by applying a radio frequency pulse at a resonance frequency of said water molecule.

11. (Previously presented) The method as recited in Claim 10 wherein said $\Delta\omega \geq 20$ ppm.

12. (Original) The method as recited in Claim 10 further includes producing a magnetization transfer magnetic resonance image from said magnetization transfer signal.

13. (Original) The method as recited in Claim 10 further includes applying said radio frequency pulse as a saturating pulse.

Claim 14. (Canceled)

15. (Currently Amended) The method as recited in Claim 10 ~~14~~ wherein said pendent arms are

identical and have the general formula:

~~$\text{CHR}_1\text{CO NR}_2\text{R}_3$, wherein R_1 , R_2 and R_3 comprise organic substituents.~~

Claim 16-20 (Canceled)

21. (Original) The method as recited in Claim 14 wherein said pendent arms R and R'' are identical, said pendent arms R' and R''' are identical, and said pendent arms R' and R''' are not equal to said pendent arms R and R''.

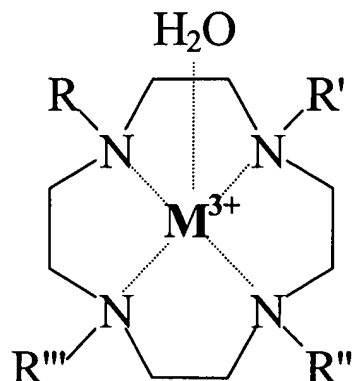
Claim 22 (Canceled)

23. (Original) The method as recited in Claim 14 further includes obtaining said magnetization transfer signal by applying a radio frequency pulse at a resonance frequency of said protons associated with said amide.

24. (Currently amended) A magnetic resonance system, comprising:

a magnetic resonance (MR) chemical exchange saturation transfer contrast agent,

wherein said MR agent tetraazacyclododecane ligand, having a general formula of:



wherein pendent arms R, R', R'' and R''' ~~comprise organic substituents~~ are amides
having a general formula:

-CR₁H-CO-NH-CH₂-R₂, wherein R₁ is selected from the group consisting of:

H;

Alkyl groups having 20 carbon atoms or less;

Cycloalkyl groups having 20 carbon atoms or less;

Alkyloxy groups having 20 carbon atoms or less;

Alkyl ethers having 10 oxygen atoms or less and 20 carbon atoms or less; and

Polyols having 20 carbon atoms or less, and

R₂ is selected from the group consisting of:

-COOEt;

-COO⁻;

-POOEt;

-PO₃⁻²;

pyridine; and

phenol, and said tetraazacyclododecane ligand further includes a paramagnetic
metal ion (M³⁺) coordinated to said tetraazacyclododecane ligand wherein said paramagnetic

metal is selected from the group consisting of:

Eu³⁺;

Tb³⁺;

Dy³⁺;

Ho³⁺;

Pr³⁺;

Nd³⁺;

Sm³⁺;

Er³⁺; and

Tm³⁺, and a water molecule (H₂O) bound to ~~associated with~~ said

tetraazacyclododecane ligand and said paramagnetic metal wherein said water molecule has a $\Delta\omega \cdot \tau_M \geq 1$ and a $\Delta\omega \geq 6$ ppm, and wherein said MR contrast agent produces a magnetization transfer signal when subjected to a radio frequency pulse; and

a magnetic resonance apparatus configured to produce said frequency pulse.

25. (Original) The magnetic resonance system recited in Claim 24, further comprising a sample containing said MR contrast agent.

26. (Original) The magnetic resonance system recited in Claim 24, wherein said sample is a living subject.

27. (Original) The magnetic resonance system recited in Claim 24, wherein said magnetic resonance apparatus produces a magnetization transfer image of said sample from said magnetization transfer signal.

28. (Original) The magnetic resonance system recited in Claim 27, wherein said magnetic resonance apparatus produces said magnetization transfer image by applying said radio

frequency pulse at a resonance frequency of said water molecule.

29. (Original) The magnetic resonance system recited in Claim 28, wherein said magnetic resonance apparatus produces a magnetization transfer difference image by applying said radio frequency pulse at a $\Delta\omega$ of said water molecule, acquiring said magnetization transfer signal and subtracting said signal from a MR signal obtained by applying a radio frequency pulse at $-\Delta\omega$.

30. (Original) The magnetic resonance system recited in Claim 27, wherein said magnetic resonance apparatus produces said magnetization transfer image by applying said radio frequency pulse at a resonance frequency of protons associated with an amide included in one or more of said pendent arms.

31. (Original) The magnetic resonance system recited in Claim 24, wherein said radio frequency pulse is produced by said magnetic resonance apparatus and is a saturating pulse.

32. (Original) The magnetic resonance system recited in Claim 24, wherein said saturating pulse is applied at a resonance frequency of said water molecule.

33. (Original) The magnetic resonance system recited in Claim 24, wherein said saturating pulse ranges from about 1 to about 3 seconds.

34. (Previously presented) The magnetic resonance system recited in Claim 24 wherein said water molecule has a $\Delta\omega \bullet \tau_M \geq 4$.

35. (Original) The magnetic resonance system recited in Claim 24 wherein said $\Delta\omega \geq 20$ ppm.

36. (Previously presented) The magnetic resonance system recited in Claim 24 wherein said

$\Delta\omega \bullet \tau_M \geq 1$ occurs at a temperature of at least about 22°C.